ІПКСФ НФаУ

Міністерство охорони здоров'я України
Національний фармацевтичний університет
Інститут підвищення кваліфікації спеціалістів фармації

Матеріали

II Науково-практичної Інтернет-конференції з міжнародною участю

ФАРМАЦЕВТИЧНІ ТЕХНОЛОГІЇ, СТАНДАРТИЗАЦІЯ ТА ЗАБЕЗПЕЧЕННЯ ЯКОСТІ ЛІКАРСЬКИХ ЗАСОБІВ

Харків, 22 травня 2025

ALOE VERA - ANTI-AGING INGREDIENT OF MEDICINAL COSMETICS

Tarapata M. O., Kukhtenko O. S., Novosel O. M., Trutaev S. I.
National University of Pharmacy, Kharkiv, Ukraine.
automcorporation@gmail.com

Introduction. As the beauty industry shifts towards comprehensive approach, with natural ingredients, medicinal cosmetics have increasingly embraced Aloe vera for its therapeutic properties. Its application ranges from topical skincare to more comprehensive formulations that combine the plant with other bioactives.

Aloe vera, a succulent plant revered across cultures for its myriad health benefits, has carved a niche in the realm of medicinal cosmetics, particularly within the category of moisturizing regenerative anti-aging products. Gels for topical applications is widely used in lotions, creams, serums designed to combat the signs of aging. The lightweight texture makes it an ideal base for a variety of formulations, allowing it to penetrate into the skin easily and deliver its bioactives to cells.

The aim of the study. The proposed updates of this review is to put into practice herbal raw material and natural bioactives by improving regenerative process efficiencies and shortening of oxidative stress in the appearance of the clinical manifestation of cells and skin aging. Here are described some biomolecular mechanisms that underline this natural phenomenon sometimes accelerated by ambient factors. We delve into the some of the properties of Aloe vera that contribute to its anti-aging effects, its bioactives benefits, and how this remarkable plant is being integrated into modern cosmetics.

Materials and methods. This study used Aloe vera leaves. The leaves were used with further purification, extraction, dehidratations etc. Fresh leaves, was divided for obtaining of, gels, dehydrated and dried products, for balsams and plant extracts. Appliances: Laboratory glassware, dehydrator, digital scales, fridge freezer, colorimeter, infrared thermometer, ph meter etc. The main remedies obtained from Aloe vera are listed as, ointments, gels, lotions, creams, serums so on.

Results and their discussion.

With the growing interest in natural and organic skincare solutions, Aloe vera stands out as a potent ingredient that not only nourishes the skin but also addresses to the aging process effectively.

The skin aging is an inevitable physiological process, which involved different cellular and bimolecular mechanisms, induced by intrinsic and extrinsic factors. One of the most evident signs of human aging is skin aging. All cells are powered by energy stored in the biochemical bonds of organic molecules on molecular level, this consists of multiple interconnected processes operating according to biochemical reactions, genetic programs, and environmental stimulus. The skin cells gradually loses its natural biofunctional proprieties and regenerative potential

Oxidative stress is attributed to aging process, by alteration of oxidative balance. During aerobic metabolism, highly reactive oxygenderived molecules produced interacting with cellular components, causing cumulative oxidative damage along time that make biocellular changes.

Oxidative damage to DNA genomes, proteins, lipids, and enzymatic and non-enzymatic protectors is associated with elevated reactive oxygen species (ROS) production, and mitochondrial function impairment (mitochondrial insufficiency). Mitochondria generate most of the chemical energy by cellular oxidative glycolysis, generating adenosine triphosphate (ATP) and intermediate metabolites for cell's biochemical reactions.

In extrinsic aging, loss of redox equilibrium result from environmental influences, such as pollution, toxins, pesticides, smoking, ultraviolet radiation, inadequate nutrition so on.

The antioxidant activity of Aloe vera is related to polyphenols, indoles, alkaloids and complex of bioactives that include minerals with vitamins. The mechanism of action is provided by boosting the growth factors and antioxidant status in cells. The antioxidant defense mechanisms, anti aging, regenerations, wound healing process take place via the Nrf2 activation (nuclear factor erythroid 2–related factor 2 is responsible for the regulation of more than 200 genes), enhancing the migration ability of HaCaTs – keratinocytes cells and HDFs (human dermal fibroblasts) that play a crucial role in all three phases of wound healing, and skin reparations.

Anti-inflammatory effects of Aloe vera is connected with inhibiting inflammatory reactions by the inhibition of cytokines IL-6 and IL-8 – intercellular mediators (responsible for controlling the growth and activity of the cells involved in the host's immune response against injury, inflammation, infections, trauma, cancer, etc.), the reduction of leukocyte adhesion, an increase of IL-10 levels anti-inflammatory interleukin that maintaining normal tissue homeostasis, and decrease of cytokine TNF-α (tumor necrosis factor) levels. TNF-α is a major inductor regulator of inflammatory responses which is involved in the pathogenesis of some inflammatory and autoimmune diseases.

One of the main bioactive polysaccharides of Aloe vera acemannan, a highly acetylated glucomannan affects fibroblast growth factor receptors and stimulates their activity and proliferation, which in turn increases the production of collagen that posses regenerative properties, wound healing, proliferation promotion, immunoregulation, anti-oxidation, neuroprotection, so on. Collagen is a crucial structural protein that provides the skin with firmness and resilience. As we age, collagen production decreases, leading to sagging and wrinkling. Incorporating Aloe vera into skincare routines may help revive collagen synthesis, thereby restoring youthful skin.

Some popular Aloe vera-infused products include:

Moisturizers. These products combine Aloe vera with additional emollients to enhance hydration while providing the soothing effects of the plant.

Serums. Concentrated formulas containing Aloe vera and other anti-aging ingredients, such as hyaluronic acid and peptides, target wrinkles and fine lines more.

Masks. Aloe vera-based masks offer a boost of hydration and nourishment, perfect for a spa day or a quick refresh before an event.

Using of fresh Aloe vera, for those who prefer a more natural approach, using fresh Aloe vera gel directly from the plant can offer immediate benefits and is especially useful for those with sensitive skin that may react to a specific ingredient in the products.

Conclusion. Aloe vera remedies posse's antioxidant with radioprotective effects, anti-inflammatory, antimicrobial, antiparasitic, antiviral activities, and cellular water holding capacity. Antioxidants function by neutralization of free radicals, unstable molecules that can accelerate skin aging. By neutralizing these free radicals, Aloe vera helps reduce the appearance of fine lines, wrinkles, and age spots.

For water-soluble vitamins, aloe gel extract is effective in prolongation of action and increasing of the absorption. For fat-soluble vitamins aloes have synergetic effect. It is unique in its ability to improve the absorption of additional bioactives and vitamins in skin care products, it should be considered also as an adjunct in preventions, treatment and for people who take supplements and multivitamins. The plant stands as a proof to the effectiveness of natural remedies in the realm of medicinal cosmetics, particularly concerning anti-aging. With its unique blend of bioactives, moisturizing properties, anti-inflammatory effects, and ability to boost collagen production, this remarkable plant has proven to be a worthy ally in the quest for youthful skin.

As the demand for effective, natural skincare solutions rises, this natural remedy will undoubtedly continue to play a pivotal role in shaping the future of anti-aging products, offering consumers a pathway to healthier, more radiant skin.

Whether as main ingredient in active formulations or as a simple addition to skincare routines Aloe vera's benefits as a powerful anti-aging solution is likely to endure for years to come.

References

1. A Single-Cell Transcriptomic atlas of Human skin aging / Z. Zou et al. *Developmental Cell*. 2020. Vol. 56(3). P. 383–397. DOI: 10.1016/j.devcel.2020.11.002.

2. Anti-inflammatory, antioxidant, and healing-promoting effects of Aloe vera extract in the experimental colitis in rats / M. A. Naini et al. *Evidence-based Complementary and Alternative Medicine*. 2021. № 9945244. DOI: 10.1155/2021/9945244.

3. Phytochemicals and In-Vitro antioxidant activities of Aloe vera gel / M. N. Uddin et al. *Journal of Bangladesh Academy of Sciences*. 2020. Vol. 44(1). P. 33–41. DOI: 10.3329/jbas.v44i1.48561.

4. Aloe vera gel as a stimulant for mesenchymal stem cells differentiation and a natural therapy for radiation induced liver damage / A. Farid et al. *Journal of Radiation Research and Applied Sciences*. 2022. Vol. 15(3). P. 270–278. DOI: 10.1016/j.jrras.2022.07.010.

5. Wound healing potential of lavender oil by acceleration of granulation and wound contraction through induction of TGF-β in a rat model / H. M. Mori et al. *BMC Complement Altern Med*. 2016. Vol. 16. № 144. DOI: 10.1186/s12906-016-1128-7.